REMARKS

Reconsideration of the application is respectfully requested for the following reasons:

1. <u>Rejection of Claims 1-13 Under §101</u>

    This rejection is respectfully traversed on the grounds that:

a. each of the claims, even before the amendment, recited hardware that rendered the claims statutory;

b. even if *some* of the elements recite means that could be enabled by software, others do not (for example, the image acquisition means are clearly disclosed as cameras);

c. the claims have been further amended to delete the "system" and "means" language and instead recite "apparatus" and hardware "units.".

Initially, it is respectfully submitted that the recitation of software does not, by itself, render a claim non-statutory, nor does the recitation of "means" that could possibly be supported by software. While the Patent Office now takes the position that recitation of software *per se* is non-statutory, it has <u>never</u> taken the position that recitation of hardware combined with software is non-statutory, *i.e.*, it has never been the position of the Patent Office that a claim reciting hardware is non-statutory just because some of the hardware elements could be implemented as software.

Original claim 1 recited image acquisition means which were clearly enabled by cameras 1000 and not by software. In addition, the "image processing unit" is clearly a disclosed as a hardware element, as is the "multi-layered image matching means," which corresponds to MSMC 4000 disclosed as including registers, processors, and other hardware elements. Of course, claims 5 and 6 are even more explicit, reciting combinations of multiplexers, registers, adders, gates, buffers, and other hardware elements that have never been considered to be non-statutory. In short, each of the original claims clearly recited elements disclosed to be hardware and claimed as such.

Even though the rejection is believed to be improper as applied to the claims before amendment, the claims have nevertheless been amended to even more specifically enabled by hardware disclosed in the specification. For example, claim 1 now recites left and right image acquisition <u>units</u> corresponding to the disclosed cameras 1000 (though not limited to the exact embodiment disclosed), and a multi-layered image matching <u>unit</u>, and the preamble of claim 1 has been amended to recite "apparatus." While some of the recited elements might utilize software, the claims are clearly directed to <u>apparatus</u> made up of a combination of elements that are enabled by descriptions of <u>hardware</u>, and therefore are clearly statutory.

2. <u>Rejection of Claims 1-15 Under 35 USC §112, 2nd Paragraph</u>

This rejection has been addressed by amending claim 1 and 14 to delete the objected-to "hardly affected" language.

3. <u>Rejection of Claims 1, 2, and 14 Under 35 USC §103(a) in view of U.S. Patent Publication No. 2002/0012459 (Oh)</u>
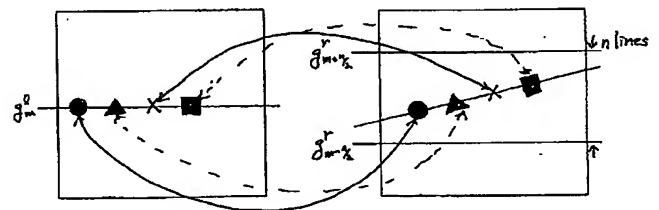
This rejection is again respectfully traversed on the grounds that the Oh publication discloses matching of each pixel in one scan line with another pixel in a **single scan line** rather than **multiple scan lines,** as claimed.

In the **"response to arguments" section of the Official Action**, the sole reason given by the Examiner for maintaining the prior art rejections was the alleged vagueness of the **"hardly affected" limitation** (see page 16, 2nd Paragraph to page 18, line 5, of the Official Action). While it is not understood why the alleged vagueness of the "hardly affected" limitation should render the claimed invention obvious when other limitations in the claim were also not met by the reference (in particular the multiple scan line limitation), the "hardly affected" limitation has nevertheless now been deleted, **thereby removing this justification for maintaining the rejection**. Since the Oh publication teaches a fundamentally different arrangement involving one -to-one pixel matching rather than matching to pixels in multiple scan lines, the Oh publication could not have disclosed or suggested this feature of the invention. Since this feature of the

invention is not disclosed or suggested by the Oh publication, or any other reference of record, the claimed invention could not have been rendered obvious by the Oh publication, and withdrawal of the rejection is respectfully requested.

Each of the claims of the present application clearly and explicitly recites **multiple** scan lines. The Oh publication, on the other hand, clearly does <u>not</u> recite multiple scan lines. As explained in paragraphs [0047] to [0049] of the Oh publication, the image matching means of Oh searches a corresponding pixel or window centered a pixel L(x+d,y) in a scanned image, with respect to **a reference pixel** or window centered at a pixel L(x,y) in reference image by using Window Matching Count (WMC) values. This search does <u>not</u> involve <u>multiple</u> scan lines, but rather one reference pixel or window centered at L(x,y) in a reference image.

As noted in the previous response, the purpose of matching pixels using a systolic array, as claimed, between one scan line and multiple scan lines, is to ensure that when the image matching means fails to locate a corresponding pixel L(x,y) in a scan line y, it will continue to search several scan lines given

(a) left digital Image   (b) right digital image

Fig. 1.   Exemplary left and right images

by y+a, wherein a ranges from -n/2 to n/2 (to obtain L(x+d,y+a), a∈[-n.2,n/2]. The image matching means disclosed in the Oh publication has no such capability. It merely searches line y, rather than line y+a, a∈[-n/2,n/2]. Therefore, if the left and right cameras are not placed properly or are subject to distortion, and the searched scan line given by y does not contain a match, then Oh can<u>not</u> find a matching pixel. For example, as can be seen in the illustration, the right digital image might be rotated with respect to the left digital image. Points denoted by ●, ▲, X, and ■ are corresponding pixels in the left and right images, but are in different scan lines. The method of Oh cannot handle this situation, whereas the claimed invention can because it searches multiple scan lines rather than just a single scan line as in the Oh publication.

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Withdrawal of the rejection of claims 1, 2, and 14 under 35 USC §102(b) is accordingly requested.

3.   <u>Rejection of Claims 3-5 and 7-9 Under 35 USC §103(a) in view of U.S. Patent Publication Nos. 2002/0012459 (Oh) and 2002/0025075 (Jeong)</u>

This rejection is again respectfully traversed on the grounds that the Jeong publication, like the Oh publication, fails to disclose or suggest matching of each pixel in one scan line with another pixel in **multiple scan lines**, as claimed. The Jeong publication merely discloses left and right image conversion and not the claimed exchange of information between two adjacent processing elements, much less the claimed matching between single and multiple scan lines. Therefore, the Jeong publication could not have made up for the deficiencies of the Oh publication, and withdrawal of the rejection of claims 3-5 and 7-9 under 35 USC §103(a) is respectfully requested.

4.   <u>Rejection of Claims 15 Under 35 USC §103(a) in view of U.S. Patent Publication No. 2002/0012459 (Oh) and U.S. Patent No. 5,867,591 (Onda)</u>

This rejection is also again respectfully traversed on the grounds that the Onda publication, like the Oh publication, fails to disclose or suggest matching of each pixel in one scan line with another pixel in **multiple scan lines using a systolic array**, as claimed. As mentioned in the previous response, the Onda patent is totally silent on use of a systolic array having processing elements which can exchange information with two adjacent processing elements. Further, the image matching means of Onda only determines a similarity evaluation value between a left window and a right window, and does not search of a pixel in the right window to correspond to each pixel in the left window, as in the claimed invention. Consequently, the Onda patent does not make up for the deficiencies of the Oh publication, and withdrawal of the rejection of claim 15 under 35 USC §103(a) is respectfully requested.

CONCLUSION

Applicants believe that this is a full and complete response to the Office Action. For the reasons discussed above, applicants now respectfully submit that all of the pending claims are in complete condition for allowance. Accordingly, it is respectfully requested that the Examiner's rejections be withdrawn; and that the pending claims be allowed in their present form. If the Examiner feels that any issues that remain require discussions, he is kindly invited to contact applicants' undersigned attorney to resolve the issues.

Should the Examiner require or consider it advisable that the specification, claims and/or drawings be further amended or corrected in formal respects, in order to place the case in condition for final allowance, then it is respectfully requested that such amendment or correction be carried out by Examiner's Amendment and the case be passed to issue.

Alternatively, should the Examiner feel that further discussion might be helpful in advancing this case to allowance, the Examiner is invited to telephone the undersigned at any time.

Respectfully submitted,

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